Missouri Forest Health Highlights 2021

Forest Health Program | Annual Report

Missouri Department of Conservation | mdc.mo.gov

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IN THIS ISSUE

EMERALD ASH BORER IN 100 COUNTIES

The emerald ash borer (EAB), *Agrilus planipennis*, is an invasive beetle that has killed millions of ash trees in North America. It was initially discovered in the Detroit, Michigan area in 2002, but EAB likely entered that region at least a decade earlier via wood pallets and crating from China. EAB has now been detected in 35 US states and five Canadian provinces, stretching its range from Manitoba to Texas and Colorado to Maine.

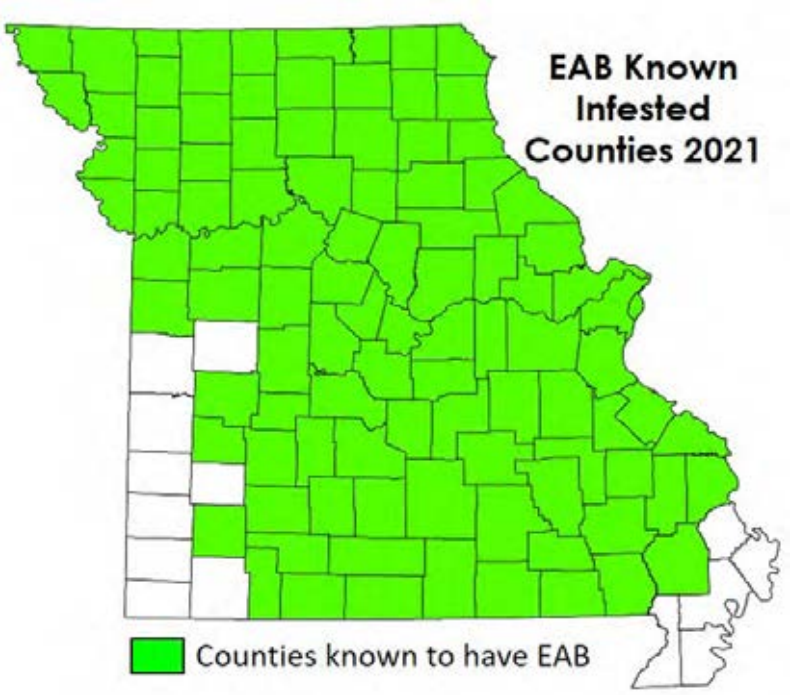

Figure 1: Missouri counties with EAB detections as of Dec. 2021.

Missouri's first detection of EAB came in 2008 in Wayne County, near Lake Wappapello. As of December 2021, 100 Missouri counties and the city of St. Louis are known to have EAB infestations. Fourteen new county detections occurred during 2021: Atchison, Audrain, Chariton, Gentry, Grundy, Knox, Lawrence, Macon, Mercer, Shelby, St. Clair, Stone, Taney, and Worth.

The Missouri Department of Agriculture monitored 139 purple prism traps in 21 counties throughout the state in 2021. Trap locations included high-risk areas like campgrounds and municipal yard waste facilities. EAB was captured on traps in twelve counties this year.

The remaining two new EAB county detections came from Missouri Department of Conservation staff observing bark blonding on ash trees. This bark damage is caused when woodpeckers search for insect larvae in trees and pop off the trees' outer bark to reveal highly noticeable, light-colored inner bark. To find new areas of EAB infestation, look for ash trees with bark blonding in late winter or early spring. **Please report suspected EAB infestations, especially if the location is in a new county where EAB has not yet been found.**

EAB populations can take a long time to build in an area. A county is often confirmed to have the pest several years before residents start noticing dying ash trees in forests and urban areas. Unfortunately, by the time trees are showing signs of bark blonding, it is usually too late to save them using an insecticide treatment. Affordable options are available to protect healthy, high-value ash trees from EAB. Please see details in the Emerald Ash Borer Management Guide for Missouri Homeowners.

EAB populations can expand slowly on their own to new areas, but EAB can move long distances in a short amount of time by hitchhiking in ash firewood. To slow the spread of EAB and other invasive forest pests, don't move firewood. Buy it as close as possible to the location you plan to burn it, or harvest firewood on site, if permitted.

For more information or to report possible EAB, send an email to Forest.Health@mdc.mo.gov.

Figure 2: Areas with high EAB populations experience extreme 'blonding' of ash trees as woodpeckers remove bark in search of larvae. Image: MDC

LAUREL WILT OF SASSAFRAS

In 2019, laurel wilt was detected killing sassafras trees in several counties in western Kentucky and Tennessee. Since then, infested areas in these states continue to expand and include detections in a western Tennessee county that borders the Missouri bootheel (see map). For the most recent map of laurel wilt locations, visit the Laurel Wilt Public Dashboard.

Laurel wilt is a tree-killing insect and disease complex, which consists of the invasive redbay ambrosia beetle and its fungal counterpart, *Raffaelea lauricola*. When introduced to trees by the redbay ambrosia beetle, the fungus causes a lethal vascular wilt disease of sassafras and other plants in the Lauraceae family. In addition to killing sassafras, research has shown that spicebush and endangered pondberry are also susceptible to laurel wilt.

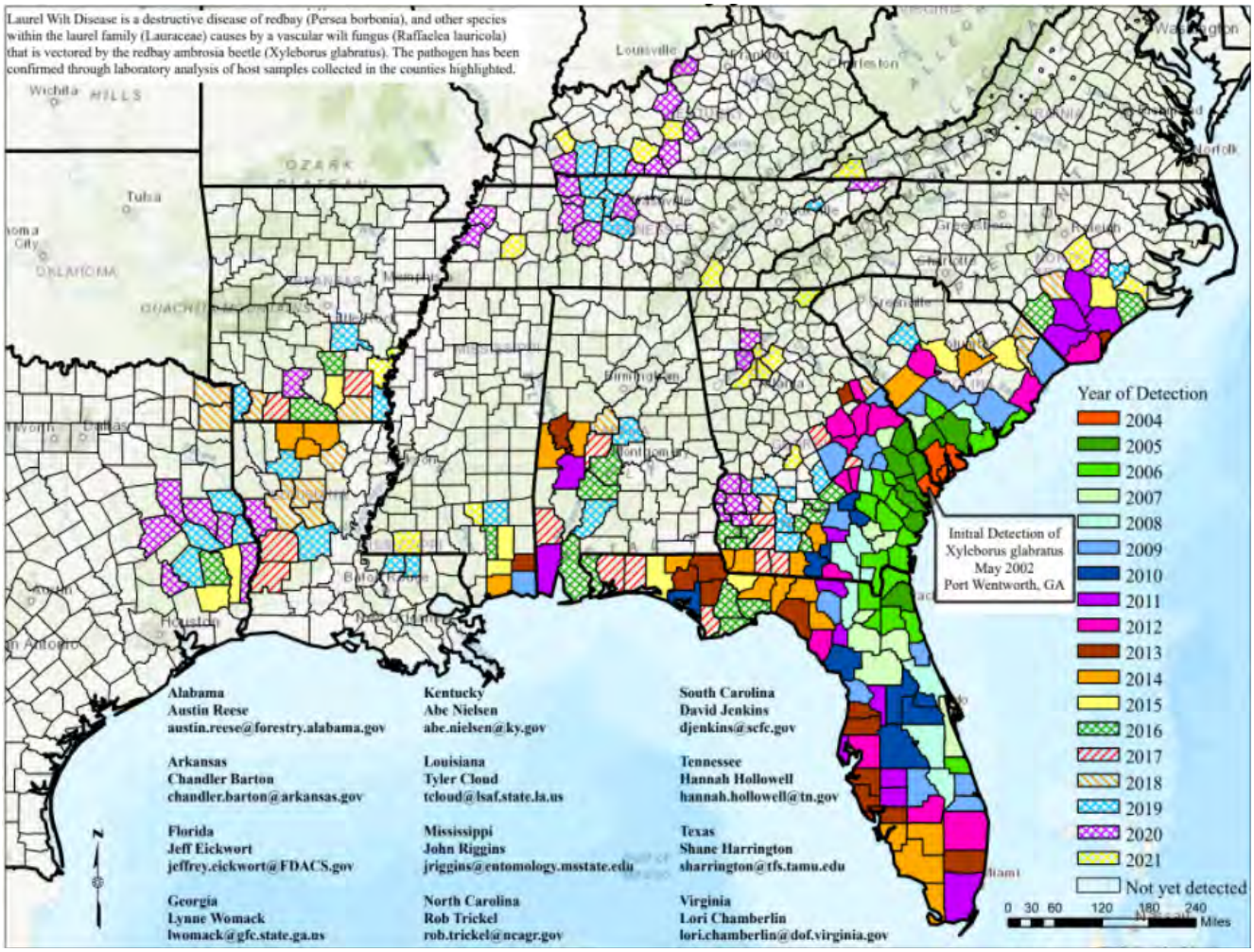

Figure 3: Current distribution of laurel wilt disease positive counties by year of initial detection. Map created by the Laurel Wilt Public Dashboard.

Figure 5: Streaking in the sapwood is a sign of laurel wilt in sassafras. Image: J Slye, NCFS.

Symptoms of laurel wilt on sassafras include rapidly wilting leaves that turn reddish-brown, dark staining in the sapwood, and small ambrosia beetle exit holes in the bark. Occasionally frass 'toothpicks' can be found coming out of exit holes. Entire clumps of sassafras may wilt, as the disease can quickly spread through lateral roots to nearby trees.

Although laurel wilt has not yet been identified in Missouri, expanding infestations in neighboring states and the 2020 find near the Tennessee-Missouri border mean that this tree-killing pest could arrive at any time. MDC's Forest Health staff ask Missourians to report dying sassafras by sending an email to Forest.Health@mdc.mo.gov.

Figure 4: Laurel wilt is a vascular disease that can easily spread through lateral roots, causing entire clumps of sassafras to wilt. Image: Chip Bates, Georgia Forestry Commission.

THOUSAND CANKERS DISEASE UPDATE

Identified in 2008, thousand cankers disease (TCD) is a disease complex consisting of the tiny walnut twig beetle (*Pityophthorus juglandis*) and a fungus (*Geosmithia morbida*) it carries to walnut trees. In Missouri, black walnut is the primary species susceptible to TCD.

TCD is the result of walnut twig beetles tunneling into the bark of walnut branches where they feed on the phloem and introduce *Geosmithia morbida*. As the fungus grows, it creates areas of infected tissue called cankers. Thousands of small cankers, along with walnut twig beetle tunnels, can coalesce to girdle branches, resulting in a decline in tree health and ultimately, tree death. Recent research suggests that the severity of TCD in eastern states is related to site and environmental conditions, including drought.

Survey and detection work for TCD is ongoing in Missouri. To date, the walnut twig beetle has not yet been detected, and Missouri is not known to have TCD.

Figure 6: Walnut twig beetle tunnel and cankering under the bark of a small walnut branch (left). Walnut twig beetle trap in a walnut tree (right). Images: MDC.

TCD Survey

In 2021, MDC and the Missouri Department of Agriculture conducted surveys for TCD using USDA Forest Service and USDA Farm Bill funding, respectively. Survey activities this year included 203 walnut twig beetle traps in walnut trees or at sawmill log piles, as well as 241 visual surveys to identify potentially infested trees. Trapping and visual surveys occurred at high-risk locations within 38 counties in central, northwest, and southeast Missouri. Branch samples were collected from symptomatic trees for lab evaluation; results showed none had any evidence of TCD. Analysis of trap catches is ongoing, but at this time there is no evidence of walnut twig beetle at any surveyed location. Since 2010, there have been 3,146 locations visually surveyed and 1,959 WTB traps deployed.

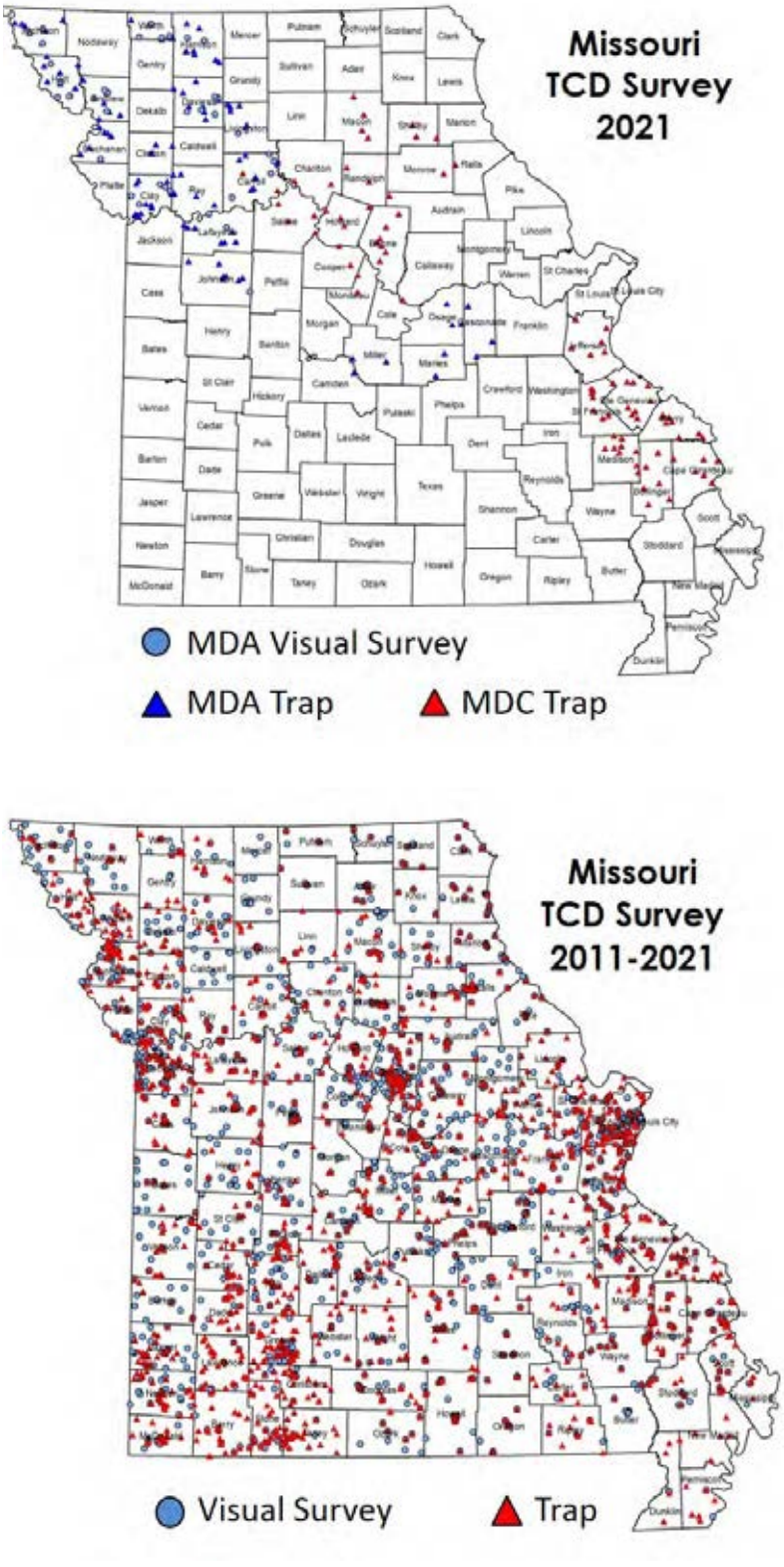

Figure 7: Locations of TCD traps and visual survey in 2021 (top), and all trap and visual survey locations since 2011 (bottom).

Because early detection of TCD is difficult, reports of walnut tree dieback and decline are very important. Visit the MDC Learn how to Identify TCD webpage to learn more about the symptoms of TCD. Please report symptomatic walnut trees to Forest.Health@mdc.mo.gov.

LYMANTRIA DISPAR SURVEY RESULTS

The multi-agency Missouri Cooperative Gypsy Moth Program conducted its annual survey to detect the presence of *Lymantria dispar* (formerly known as gypsy moth) by placing and monitoring 4,689 traps in 43 counties. Five male moths, all of European/North American genetic origin, were captured statewide in 2021. All five of these moths were captured in St. Louis County, likely because of the number of people (and hitchhiking pests!) moving to and through the greater St. Louis area. Next summer, the areas where moths were captured will be intensively surveyed to confirm no breeding populations of *Lymantria dispar* are present.

Missouri is not known to have any established populations of *Lymantria dispar*. It is very easy, however, to transport this pest's egg masses to our state accidentally. People moving to Missouri from infested states are legally required to examine all outdoor articles for tan, fuzzy egg masses. Please remove these masses before moving items to Missouri.

Figure 8: Sticky traps containing *Lymantria dispar* pheromone are used to survey for the foliage-feeding pest (left). Five male moths, including the one pictured, were captured in sticky traps in Missouri in 2021 (right). Images: MDC.

2021 WEATHER UPDATES

Late Spring Frost

A hard freeze in mid-April caused damage to trees, particularly in the southern half of the state. In much of the Missouri Ozarks, trees growing in valleys and low-lying areas lost their entire first set of leaves and flowers. The appearance was striking with a distinct division between affected and non-affected trees or portions of canopies. Trees reflushed several weeks later, with some looking bare well into June.

Figure 10: Swamp white oak with frost damage to the first set of leaves. Image: MDC.

Figure 9: Frost injury to newly expanded leaves resulted in trees that dropped their leaves and reflushed several weeks later. Image: MDC.

The Weather "Pendulum" Swing

The last several years have been a wild ride for all of us–trees included! While the trees may not be enduring a global pandemic, they are being exposed to some difficult weather patterns, including drastic shifts from wet-to-dry and dry-to-wet conditions. It's no longer a rare event for Missouri trees to receive more than three inches of rain in 24 hours (sometimes in less than an hour!), then not get another drop for three to six months. This type of water stress–both super wet and very dry–has the potential to stress tree roots and leave them more susceptible to pests and pathogens.

In 2021, many areas of the state recorded above-average rainfall totals according to Missouri Mesonet. Much of this extra precipitation fell between May and mid-July; parts of Boone County received 25 inches of rain in just 29 days between June 15th and July 13th! As summer turned to fall, precipitation slowed or stopped in many counties. U.S. Drought Monitor was tracking around half of the state in the abnormally dry category throughout the fall and winter.

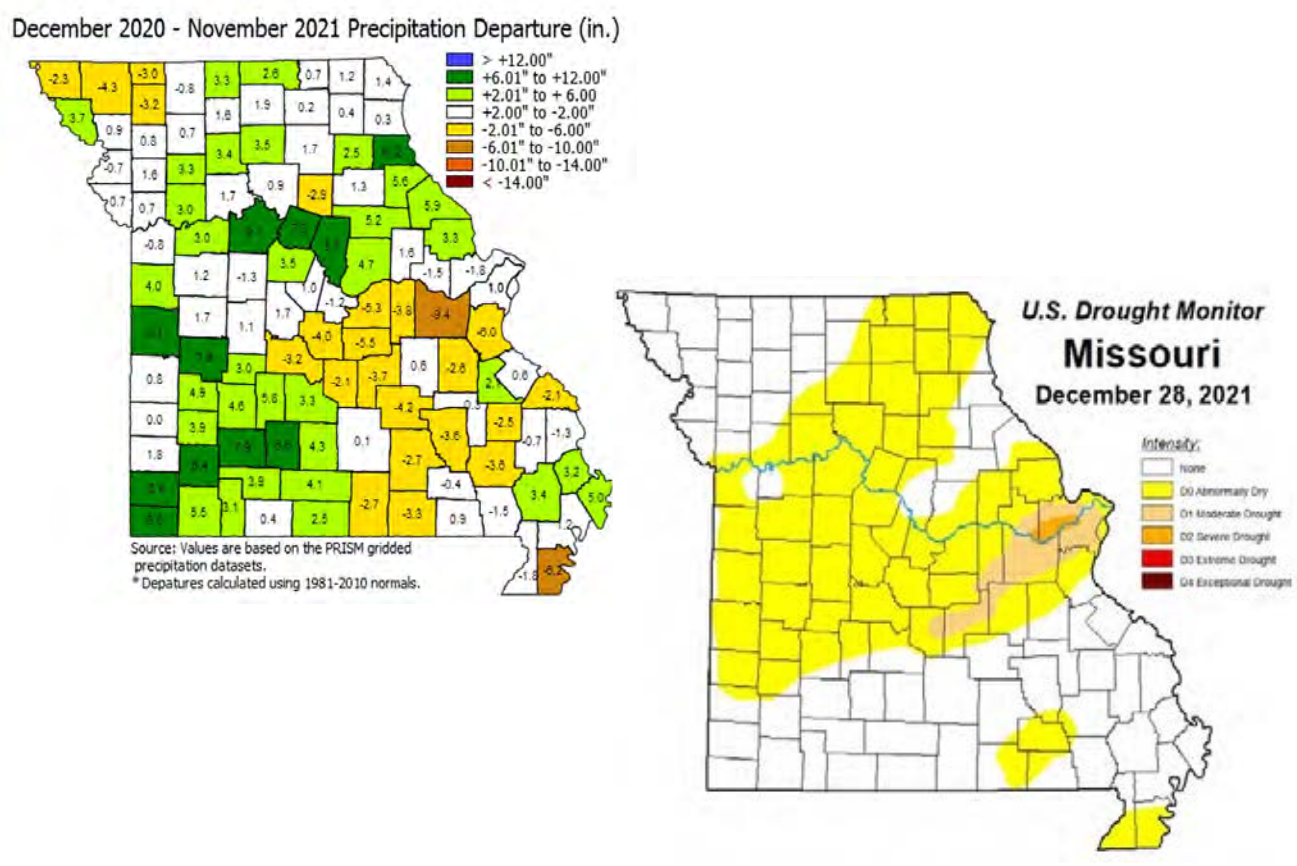

Figure 11: Map of precipitation departure from normal (December 2020-November 2021) by Dr. Pat Guinan, University of Missouri Extension Associate Professor in Climatology on Missouri Mesonet (left) compared to the December 28, 2021 drought map by Brad Pugh (CPC/NOAA) on U.S. Drought Monitor (right).

ARMILLARIA ROOT ROT

Throughout 2021, MDC Forest Health staff identified Armillaria root rot in numerous urban and forest trees. Armillaria root rot is a common root disease of trees caused by several closely related species of Armillaria fungi. This native disease can affect many tree species but is most commonly observed on oak, maple, and elm in Missouri.

Armillaria infections often go unnoticed as the fungi parasitize the root systems of living trees. Armillaria is frequently identified late in in the infection, and only then by removing the bark on major roots or the root collar to expose white mycelial tissue. In some species, such as sassafras, armillaria infection can result in dark sap weeping through the bark.

Symptoms of Armillaria root rot initially include stunted leaves, reduced tree vigor, and canopy thinning. As the disease progresses, significant branch dieback becomes noticeable and root

Figure 12: Trees suffering from Armillaria root rot often display symptoms of decline, including branch dieback, thin canopy, and discolored leaves. This tree had multiple clumps of Armillaria mushrooms growing around the trunk. Image: MDC.

and heart rot weaken the structural integrity of trees. In some cases, the disease progresses quickly, resulting in trees that wilt suddenly in late summer. These symptoms can be similar to those of other diseases, making it easy to misdiagnose Armillaria.

When weather conditions are favorable in early fall, Armillaria can produce masses of light-brown honey mushrooms at the bases of trees or from roots near the soil surface. This year, Armillaria mushrooms were not noticed until late October and early November, likely due to the extended dry, warm fall seen in Missouri. While the mushrooms can be helpful in identifying Armillaria, tree health professionals should not rely on the presence of mushrooms for diagnosis.

In urban or yard settings, Armillaria root rot can result in hazardous trees and difficulty establishing new trees. Read more about this disease in the Armillaria Forest Health Alert, available on the MDC Missouri Forest Health news webpage. The Forest Health Program also has a new fact sheet available with photos and tips for identifying Armillaria in the field. Please email Forest.Health@mdc.mo.gov for a copy of this fact sheet.

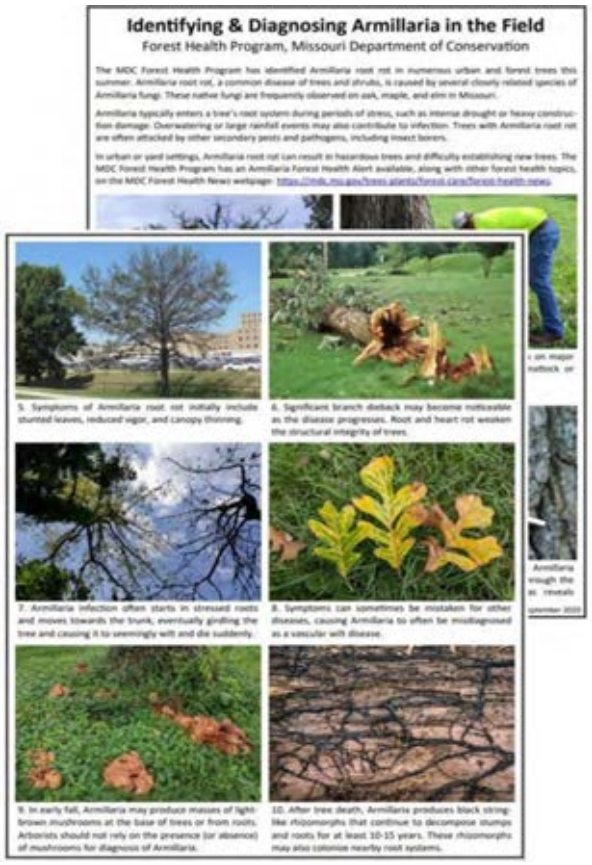

Figure 13: When conditions are favorable in the fall, clusters of brown Armillaria mushrooms may form on the trunk or roots of infected trees (left). The MDC Forest Health Program has a fact sheet titled “Identifying and Diagnosing Armillaria in the Field” available upon request (right). Images: MDC.

MANY REPORTS OF SKELETONIZED PIN OAKS

In 2021, an unknown leaf-skeletonizing insect was reported on pin oaks throughout northeast Missouri. By the time MDC Forest Health staff could investigate, the culprits were long gone. The most likely insects are both native species—the scarlet oak sawfly (*Caliroa quercuscoccinae*) and the oak skeletonizer moth (*Bucculatrix ainsliella*). It is unclear if recent mild weather patterns or some other factor led to the increased number of reports. Natural enemies are likely to control these leaf-feeding insects in the upcoming growing season, reducing their populations naturally without the need for insecticides.

Figure 14: Pin oaks were skeletonized by a mystery insect in late summer, leaving lacy white and brown leaves (top). Scattered pin oaks were easy to identify due to their brown canopies (bottom). Images: MDC.

HERBICIDE INJURY COMMON ON TREES

If you follow agricultural news, you have likely heard about some of the herbicide concerns in Missouri and surrounding states. Since the 2017 growing season, millions of acres of crops—from soybeans to peaches, grapes, and watermelons—have been injured by new over-the-top formulations of dicamba and 2,4-D used on soy and cotton fields. Injury has also been reported on many different tree species in both yard and forest settings. For more in-depth information, view MDC Forest Entomologist Robbie Doerhoff's 2020 EAB University Webinar on YouTube: https://youtu.be/ZdxeoX2QobY.

The appearance of herbicide injury symptoms on an individual tree varies based on the tree's species and its relative health, the time of year, and the herbicide used. Herbicide injury symptoms caused by dicamba or 2,4-D generally include curled, cupped, pale, twisted, and/or strap-like leaves. In some cases, the tips of twigs can be twisted and deformed or even killed. Large trees severely injured by these herbicides typically have thin crowns and few normal

Figure 15: White oak with severe herbicide injury. This tree tested positive for dicamba (118 ppb). Image: MDC.

leaves. Oaks (especially white oak), sycamore, redbud, and bald cypress are particularly sensitive.

Trees often recover from moderate herbicide injury, but severe or repeated damage may ultimately lead to tree decline and death. It's best to take a wait-and-see approach; some trees may make a full recovery within a couple of growing seasons. To help trees recover, provide supplemental water 2-3 times per month during dry periods (aim for 10 gallons of water per diameter inch). Encourage the growth of fine feeder roots by installing a 3-inch-deep organic mulch ring. Avoid fertilizing injured trees for at least a year so as not to encourage excess growth and stress.

In late 2020, the US Environmental Protection Agency decided to renew the registrations on over-the-top dicamba products for five years (through the 2025 growing season). The agency is currently reviewing these registrations due to widespread herbicide injury reported in 2021. If you notice herbicide injury on your trees or garden plants in 2022, report the damage to the Missouri Department of Agriculture's Bureau of Pesticide Control. You can fill out an online form at http://agriculture.mo.gov/plants/pesticides/incidentreport.php.

Figure 16: Willow oak with moderate herbicide injury. This tree tested positive for both dicamba (51 ppb) and 2,4-D (200 ppb) despite being located nearly a half mile from the nearest farm field. Image: MDC.

FIREWOOD: CAMPGROUND OUTREACH

The MDC Forest Health Program is working with campground and RV park owners to help spread the message of safe firewood usage and the importance of not moving firewood. There is a variety of free outreach items available for campground and RV park offices, including a new "What's in Your Firewood Brochure", brochure holders, magnet notepads, pens, kid activity sheets, and crayons.

Figure 17: A variety of outreach items are available to campgrounds and RV park offices. Image: MDC.

If you know of a campground or RV park office interested in obtaining any of these free items, please send an email to Forest.Health@mdc.mo.gov.

Questions?

Contact your local Forester with the Missouri Department of Conservation.

Find contact information for your county at:

mdc.mo.gov

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